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STUDY OF ECONOMIC IMPACTS OF POLLUTION CONTROL ON THE IRON FOUNDRY INDUSTRY

PART III - THE ECONOMIC IMPACT OF POLLUTION ABATEMENT UPON THE IRON FOUNDRY INDUSTRY

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for the
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PART III - THE ECONOMIC IMPACT OF POLLUTION ABATEMENT UPON THE IRON FOUNDRY INDUSTRY

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PART III - THE ECONOMIC IMPACT OF POLLUTION ABATEMENT UPON THE IRON FOUNDRY INDUSTRY

A - PRICE INCREASES

EFFECT OF PRICE INCREASES ON COMPETITION

Previous discussions have established that the costs of installing and operating pollution control equipment cannot be absorbed by normal operating costs, nor are they compensated for by any other reductions in costs or gains in productivity. These added costs, therefore, can only be recovered by superimposing them on the existing manufacturing costs of castings, and passing them on to the user or purchaser of the castings. Further, it has been shown that these added costs will range from $1.37 to $14.05 per ton of castings, depending on the type of controls which are used, and on the size and production output of the foundry. The effect of these added costs on the prices of castings will be generally as shown in Exhibit 35.

Competition of substitute products and imports of foreign castings have become increasingly significant, as technology advances have introduced new competitive products for items which were traditionally made of iron, and foreign iron foundries have become sufficiently capable of producing the quantity and quality of iron castings which were needed, at costs well below American costs. The principal competitive products and materials which have cut into iron castings markets were shown on Exhibit 34. Although many cast iron products are relatively free of competition from other materials because of their desirable properties

and lower costs, pipe products shown on Exhibit 34 have been increasingly subject to inroads by the competition.

Similarly, the imports of iron castings and products of cast iron have been increasing. The figures of iron castings imports shown on Exhibit 5 are not necessarily representative of actual conditions, since many imported iron castings are listed in terms of the end use rather than as a casting. This is particularly true of automotive, machinery, and hardware castings. The fact that foreign castings can now be laid down on the docks, duty paid, at a lower cost than U.S. foundry costs is having a significant effect on the balance between imports and exports of iron castings, and can be expected to increase in importance in coming years.

Naturally, the effect of an increase in iron castings prices to cover costs of pollution control, is going to have an adverse effect on the competitive position of iron castings relative to competitive products and imports. This will, of course, be partly offset by the fact that other industries producing competitive products, as well as many foreign iron foundries, are also going to have to install pollution controls which will have an increasing effect on their prices. However, in the near future it is believed that the effect on increasing iron castings prices will be greater, thereby tending to give an advantage to competitive products and to imports.

COMPETITION WITH LOW COST FOUNDRIES

The financial figures previously developed showed a wide range of castings costs dependent on the type of casting and the size and degree of automation of the foundry. These prices ranged from under $200 per ton for cast iron pipe, soil pipe, ingot molds and some types of automotive castings, to more than $800 per ton for low volume, complex castings produced in small jobbing foundries. This range of costs was shown for various sizes of foundries in Exhibits 27 and 28.

It is noteworthy that the wide range of costs is not in the same product classifications, but rather between the specialty, high volume foundries, and the jobbing, low volume foundries. Therefore, the question which must be answered should be: "Can the high volume, low cost foundries produce the jobbing type of castings now made in small foundries, and thereby absorb some of their business?"

In general the answer to this question is negative. Specialty foundries such as those producing ingot molds, cast iron pressure pipe and soil pipe are not equipped to produce miscellaneous types of castings. The high production, automated foundries operated by the automotive and agricultural equipment industries can physically produce specialty castings but, from a practical point of view, do not do so. The losses in production and high overhead costs involved in interrupting their high production lines would result in impossibly high prices for these jobbing castings.

The principal competition for the types of castings produced by small jobbing foundries is within the jobbing segment of the iron foundry industry. Some of these foundries are comparatively large, and can produce castings at lower costs than the very small foundries. This will be even more true after the costs of pollution control have been included. These medium- and large-sized jobbing foundries have generally not been operating at full capacity, and most of them have ample added capacity for increased volume of business.

In addition to the capacity available in medium and large jobbing foundries, is the additional production capability of many of the small- and medium-sized captive iron foundries (which are operated by manufacturing companies) to produce their own iron castings requirements. In many cases these foundries are essentially jobbing type foundries, set up to produce the same types and quantities of castings which are produced by small jobbing foundries. Some of these shops are presently increasing their output of castings for other companies as a means of absorbing overhead and fixed charges. This puts them in direct competition with the regular jobbers.

The figures shown in Exhibit 21 illustrated that the capacity for producing iron castings, as judged by melting capacity, is substantially higher than production requirements. Although a breakdown of these figures by size of foundries is not available, a general survey of many larger jobbing and smaller captive foundries has indicated that capacity does exist, and is

sufficiently widely distributed to produce a large part of the volume now handled by small jobbing foundries.

It is estimated that the 652 foundries expected to shut down by 1980 produce approximately 1,000,000 tons of castings per year, as follows:

No. of Foundries	Employment Range	Production in 1970 Tons
27	100-249	150,000
137	50-99	465,000
488	1-49	385,000
652		1,000,000

This total represents only 7% of the 1970 production for the iron foundry industry, but about 18% of miscellaneous castings produced the same year by jobbing foundries. Competition among the remaining small- and medium-sized jobbing foundries will be strong to obtain this additional business. It is expected that foundries in the same, or next larger size category as the companies that have gone out of business, will be interested most in the additional business. These foundries will be the ones most able to produce castings of the type and order quantities originally produced by the defunct foundries. For reasons of size, weight and shipping costs, competition will be strongest in a 150- to 200-mile radius of the castings purchaser. Pollution control equipment costs per ton of metal poured decrease rapidly with increasing production. Because of this the

larger foundry will be able to offer a lower per pound price and, other factors being equal, obtain a disproportionate share of the market. It is estimated that up to 75% of the casting business of a defunct foundry will go to foundries in the next larger size categories.

Competitive factors notwithstanding, the very small shops will never disappear completely from the scene. The more or less local demand for small quantities of iron castings will insure the survival of some small foundries with inherent quick response capabilities, even with a higher cost product.

B - FACTOR DISLOCATIONS WITHIN INDUSTRY

FUTURE OPERATING STABILITY OF FOUNDRIES

Data previously presented in Exhibit 18 have shown the historical record of the decline in number of iron foundries in the U.S. The most significant facts regarding this are that there has been a steady decrease in the number of iron foundries since the end of World War II, (from 3,320 in 1947 to 1,670 in 1970) and that this decrease has been almost entirely among the smaller foundries with fewer than 100 employees. In fact the rate of shutting down of iron foundries became more pronounced as the foundry size became smaller, with the most severe attrition being among the very small shops with under 20 employees.

Projections to 1980 have shown that the rate of closing of iron foundries will continue undiminished or possibly at an even greater rate, and that this will continue to be concentrated

among the small foundries. The reasons for this are not difficult to trace. The increasing costs of labor, and the greater difficulty in recruiting and holding skilled foundry labor, have resulted in a continuing increase in the degree of mechanization in foundries. It was once possible to operate a foundry on a very small investment in equipment, and to use the same crew to perform all of the functions of melting, molding, pouring and cleaning. The modern foundry requires a high investment cost, with labor being fixed in single area jobs, necessitating relatively continuous operation of the shop.

To all of these problems, the additional consideration of pollution control is now being added, requiring the installation of expensive equipment without increasing production or earnings. This has caused many marginal operators to go out of business, and can be expected to continue to have this effect for the next decade.

In terms of the classifications of representative foundries by employment, previously discussed in Exhibit 18, the closings of iron foundries are expected to be concentrated among the following:

(1) Small foundries, generally under 100 employees, with percentage of foundries closing increasing as the sizes decrease. Thus it is expected that within the next 10 years there will be very few independent iron foundries with less than 20 employees, and relatively few in the range of 20 to 40 employees.

(2) The older foundries will be closed at a much higher rate than the more modern plants, since the costs required to modernize, mechanize and provide pollution control become increasingly greater with increasing age of the foundry.

(3) The foundries with a high degree of manual, obsolete type of equipment will be closed at a higher rate because of the high costs required to raise their level to meet modern technology and costs.

In terms of other classification systems for representative foundries, only the most general projections can be made due to the lack of specific data. The industry can be classified, aside from size, by metal cast, ownership, product and age. The following comments are appropriate to these classifications.

(a) Metal Cast

Gray iron and ductile iron are produced in the same foundries and their operating stability is as represented in the previous paragraph. An additional factor must be considered relative to the stability of malleable iron foundries. No new malleable shops have been built in recent years due to the development of ductile iron, which is a less costly iron with almost identical properties and which can be produced by a gray iron foundry. Although production of malleable iron has been relatively constant during the last ten years, it will gradually be largely replaced by ductile iron. The generally old malleable foundries are expected to close down in the future, or convert

to the production of ductile iron, a trend that will undoubtedly be accelerated by the need for large investments in pollution control equipment. The ease of conversion, involving the removal of annealing furnaces no longer required, suggests that more foundries will be converted than closed down. The number of malleable iron foundries has declined from 104 in 1963 to 93 in 1969 (as shown in Exhibit 20) and is now about 90.

(b) Ownership

Current data indicate that 25% of all iron foundries are captive operations of larger non-foundry companies; 75% are independent. The stability of the independent foundries can be largely determined by size, as described earlier. The owners of captive foundries, while probably not limited by financial considerations to the extent of the small independent foundry, will nonetheless base the decision to remain open or to close down the foundry and purchase castings outside on a cost-benefit analysis. No substantial difference in the ratio of foundry closings is projected between captive and non-captive foundries since the economics of the two are the same for a given size range.

(c) Product

The classification of foundries by product includes cast iron pipe, ingot molds and miscellaneous castings. Producers of pipe and ingot molds are large foundries. It is expected that all of these will install the required control equipment and remain in business. The viability of miscellaneous castings producers will be related to size as discussed earlier. There are

now about 65 foundries producing pipe and ingot molds, but these account for about 34% of all iron castings production.

(d) Foundry Age

Most of the long established foundries have replaced some old and obsolete equipment with new through the years. The result is that in large part the average foundry contains equipment ranging widely from old to new, or nearly new. The same can be said of foundry processes and technology. Even the smallest shop can be found to use recently developed chemical binders for molding and core sand, and many small and medium foundries are equipped with electric induction melting furnaces, and mechanized equipment.

The iron foundries that have closed down in recent years include those that have not undergone continual modernizing, and those expected to close down for non-pollution control reasons in the future will include more of this type. The obsolescent foundries have thus been weeded out by their inability to compete in an industry of growing technology, and the trend will continue independent of control investment requirements.

Foundry age is therefore not as directly related to viability as it might be in an industry where the age of the plant indicates the efficiency, design and obsolescence of the productive equipment.

REASONS FOR DISLOCATIONS OF FOUNDRIES

The financial data previously presented indicated that the effect of installing and operating pollution controls on the earnings of iron foundries would be to increase costs, and thereby decrease earnings. In general, this effect was more pronounced for the small foundries, resulting in a higher reduction of earnings. However, in practically all cases, this will be offset by an increase in castings prices to maintain a relatively constant level of profitability. Because of the fact that all foundries will be faced with the same problem, the net result will be an industry increase in castings prices to pay for the costs of pollution control. In view of the limited availability of substitute products for the miscellaneous type of castings, which accounts for production of most of the iron foundries, the increase in prices will not by itself result in a widespread closing of foundries or of dropoff in production.

The principal problem which is expected to affect the iron foundry industry involves capital availability to install pollution control equipment, particularly among the small foundries. This problem has been existent among small iron foundries for many years, and as previously described, has resulted in a steady decline in the number of iron foundries at a rate of about 75 per year. This rate is expected to increase as the need for installing pollution controls becomes mandatory. For the small foundries, particularly those under $500,000 in annual sales,

the cost of installing pollution control will often exceed the total worth of the foundry, and may exceed the annual value of sales. When combined with other capital expense needs for modernization to compete with larger foundries, the need for installing pollution control literally becomes the "last straw" for many foundries.

C - EFFECTS ON RELATED INDUSTRIES

AFFECTED SUPPLIERS AND CUSTOMERS

With the possible exception of cast pipe products, it is not believed that the increases in castings prices, which will be caused by installation of pollution controls, will result in any significant shifts from iron castings to other materials or to imports. The principal effects in the iron foundry industry have been determined to be caused by closing of small foundries, with the output from these foundries being shifted to other larger shops, probably within the same geographical area.

The overall impact on suppliers will therefore be minimal, with the principal effect being to shift some business in supply of purchased scrap from one dealer to another. Since most pig iron, coke, ferroalloys and refractories are shipped from greater distances, there will be little or no effect on suppliers of these items caused by any shifts of production from one foundry to another.

Customers of iron castings will generally be even less affected, since most castings buyers traditionally purchase from

more than one foundry. Additionally, surveys of iron castings capacity versus production have shown that there is ample capacity to take up any production which is released by foundries which are closed.

IMPACT ON CUSTOMER INDUSTRIES

The increases in costs due to pollution control installation have been previously determined to be generally passed on to the castings purchaser. Inevitably these costs will be again passed on until they reach the ultimate purchaser or user of the final product. In an automobile, for example, which may contain a total of 0.25 tons of iron castings, the total effect of the cost of pollution control would be to raise the price approximately 50 cents. It is evident that the effect of pollution control cost is very minor in its effect on the end product price.

Dislocations caused by closing of small iron foundries are likely to be of even less concern to the castings customers, since the widespread distribution of iron foundries will, with minor exceptions, not require substantially greater shipping distances from the foundry to the customer.

IMPACT ON FOUNDRY SUPPLIERS

The overall impact on iron foundry suppliers of pig iron, coke, scrap, refractories, ferroalloys, fluxes and sand, is expected to be minor, because the total production of iron castings is not expected to decline as a result of installation of

pollution controls. The principal effects will be local, on dealers of scrap and other supplies for foundries. Where small foundries may close their output may be shifted to foundries in other communities.

D - INDUSTRY DISLOCATIONS

IMPACT ON GROWTH OF FOUNDRY INDUSTRY

The growth of the iron foundry industry must be assessed from two aspects--production of castings and number of iron foundries. The production record of the industry, previously shown in Exhibits 1 and 7, has exhibited a very erratic pattern, but generally has shown an overall growth trend of about 2% per year. This has been projected to continue at about the same rate, and is not expected to be affected by price increases due to installation of pollution controls.

On the other hand, the number of iron foundries has been declining steadily for the past 25 years, and is expected to continue to do so, as shown in Exhibit 18. This is related in only a nominal degree to pollution control, since the decline in the number of small iron foundries was going on long before the impact of pollution control was felt, and has been only somewhat accelerated by this factor. Reduction in the number of iron foundries, when combined with the modest increase in production, will result in a higher production per average foundry with the average annual output increasing from 3,800 tons in 1947 to 8,700 tons in 1969, and projected to 16,500 tons in 1980.

IMPACT ON NATIONAL PRICES

The effect of pollution control on iron castings costs have been estimated, in Exhibit 35, to range from about $1.49 per ton for cast pipe, to the range of $2.23 to $14.05 per ton for miscellaneous castings. Since the weight of iron castings in average consumer products is often only a minor part of the total, in the range of 10% to 30%, the net effect on product prices will be relatively minor. For example, the cost of an average automobile has been estimated to increase about 50 cents due to installation of pollution control on iron foundries.

IMPACT ON EMPLOYMENT IN FOUNDRY INDUSTRY

The iron foundry industry currently includes 1,635 captive and independent foundries, ranging in size from under 10 employees to more than 1,000 employees, with a total employment in 1971 estimated to be 225,805. The distribution of the foundries by size, and the historical record of the decline in the number of iron foundries were shown in Exhibit 18. The reduction in foundries has been almost entirely among the smaller companies employing under 100 people per foundry. An analysis of the closings has further shown that the average of 75 foundries that have closed per year has concentrated among those who have employed fewer than 50, and that the percentage has increased as the foundry size range decreased.

Based on this data, and on the fact that the financial burden

has been shown to be disproportionately higher for pollution control, as the foundries become smaller, the projection of the number of foundries which are expected to close in the next 10 years is as shown in Exhibit 36. The foundries over 250 employees show no closings, those from 100 to 250 show 10% closing, from 50 to 100 show 40% closing, from 20 to 50 show 60% closing, and the smallest size foundries, under 20 employees, show 80% closing.

The net result of these estimated projections is that the total number of foundries estimated to close by 1980 is 652; this will reduce the total number of iron foundries from 1,635 to 983. Employment in the closed foundries is estimated to be 26,480. However, it is believed that almost all of these foundries will be independent or captive jobbing types producing miscellaneous castings, for which there will be little or no substitution of other materials or of imports. It is believed that the output of these closed foundries will be picked up by other foundries located as near as possible to the customers' plants.

The result of this shift in production from the small foundries that are closed to the larger surviving foundries will be an increase in output, and therefore, in employment in these foundries. However, two factors will result in unemployment in the areas in which the closed foundries are located. The first involves the fact that the gains in employment, due to individual foundries picking up production from the closed foundries, may not be in the same community or even area, which would result in loss of jobs in some areas, and gains in employment in other

areas. The second factor involves the relationship of labor requirements to production in the closed foundries, as compared to those which increase their capacity. It has been estimated that approximately one-half of the labor requirement would be added to an existing foundry to increase its production as was used in a closed foundry to maintain that production. Therefore, the net loss in employment in the iron foundry industry in the next decade is estimated to be approximately 13,200, reducing the total employment to 212,600.

In assessing the impact of pollution control on the closing of iron foundries, and the resulting unemployment, it should be noted that many of these foundries would have closed in any event, and that in many cases the added burden of the cost of pollution control only accelerated the rate of closing.

Two added factors that must also be taken into account are: the expected growth of castings production requirements, which has been estimated at 2% per year and would project to 22% in the next 10 years; and the continued improvement in mechanization and automation in iron foundries, which will result in a greater productivity per unit of labor. The historical annual productivity improvement in gray iron foundries only, reported by the Department of Labor for the period from 1954-1966, is 2.85%. Uncertainties in both factors are estimated to be a minimum of $\pm$ 0.5%. This estimate is based in part on the lack of data on malleable and ductile foundries, the lack of data for the years

following 1966 from the Department of Labor, and in part from the projection of casting demand through 1980. Because of the uncertainties, the most reasonable and conservative estimate is that the two factors will balance each other, and that employment will not be affected in any but a moderate way.

Approximately 2,250 of the 13,200 foundry workers, estimated to be unemployed as the result of foundry closings through 1980, will possess skills directly transferrable to other industries. If a local demand for these skills exists at the time of a foundry closing, these workers will be absorbed into other industries, leaving a net employment dislocation of approximately 10,950.

A final factor to be considered is that of normal attrition in both the industry work force and the dislocated employees. The ten-year period 1971-1980 inclusive, represents approximately 20% of the normal 45-year work life. This attrition applied to the remaining work force will provide employment opportunities in excess of the net dislocated employees, while the same factor applied to the dislocated employees will reduce their number. The net effect on the number of dislocated employees is expected to be small, except in the large industrial cities with concentrations of foundries, due to the relatively limited mobility of workers with foundry skill levels. In the industrial cities with a number of large foundries, the greater number of job openings resulting from normal attrition will be sought by a larger number of dislocated employees.

IMPACT ON BALANCE OF PAYMENTS

In discussing the impact of pollution control on the balance of payments, the assumption has been made that the only area which is considered is the relationship of imports and exports of iron castings, as was shown in Exhibits 4, 5 and 6. The principal import items have been iron pipe and fittings, while the principal exports have been miscellaneous rough castings. The balance of payments has consistently been in favor of U.S. exports. However, note should be made of the fact that imported iron castings are often identified in terms of the end use, such as automotive or machinery parts, rather than as castings. Therefore, reported import figures are undoubtedly considerably lower than the actual figures.

Ultimately, when foreign iron foundries are required to install pollution controls, the effect of this cost will not be a factor in imports versus exports. However, in the short term, when U.S. foundries are spending money for controls while foreign foundries are not, the foreign sources will have an economic advantage which will probably result in a reduction in exports and an increase in imports. This will, of course, adversely affect the balance of payments. There have not been any estimates made of the possible change in the dollar balance. However, in terms of the total value of iron castings produced, the reported imports represent only about one-tenth of one percent, and are therefore an insignificant factor in the total picture.

IMPACT ON INVESTMENT AND CAPITAL MARKETS

(a) Definition

Investment and capital markets in the context herein mean total debt and equity capital raised in the public capital markets of the domestic United States, excluding markets for state and local capital issues.

(b) Analysis of the Data

The September, 1971 Federal Reserve Bulletin (Table A-48) quantifies recent history in the public capital markets as follows:

Year	Amount $ Millions
1963	35,199
1964	37,122
1965	40,108
1966	45,015
1967	68,514
1968	65,562
1969	52,496
1970	88,664

Public capital markets in the U.S. are large and well organized. The following demands on these markets for iron foundry air pollution devices are forecast in the supplemental data provided by the Council on Environmental Quality.

Forecast Year	In Millions of Dollars Total Iron Foundry Air Pollution Control Devices Investment Annually	Cumulative
1972	$23.9	
1973	39.1	$63.0
1974	115.4	178.4
1975	130.6	309.0
1976	39.1	348.1

It is inconceivable that demands of this magnitude could in any way dislocate these capital markets.

(c) Analysis of Alternative Means of Financing Pollution Control Devices and Probabilities of Success

Pollution control devices are regarded by iron foundry operators as nonproductive investments. The social and physical consequences are viewed as too remotely related to current profits to employ the profit motive in a positive direction to install pollution control devices through the usual inducements of accelerated depreciation, modest investment, tax credits, low interest loans, and so on. It may therefore be necessary for the Council on Environmental Quality to seek more powerful inducements such as grants and direct, large offsets against federal income taxes.

The Institute of Public Administration issued an interim report on July 21, 1971 to the Office of Air Programs of the Environmental Protection Agency in which it classified financial

inducements into three categories: no assistance, subsidies, and financing assistance. It mentioned within those categories:

1. Loan guarantees
2. Grants and subsidies
3. Provisions of Highway Beautification Program of 1965
4. SBA loans
5. Economic opportunity loans
6. Depressed areas' provisions of the Economic Development Act of 1965
7. Provisions of the Trade Adjustment Assistance Program of the Trade Expansion Act of 1962.

An extension of such a listing giving judgmental ranking in increasing order of likelihood of success may serve the Council's purposes. Such a ranking of several but not all financing means might be as follows:

Little Likelihood of Success

1. Accelerated depreciation.
2. 7% investment tax credit.
3. Guaranteed commercial bank loans.
4. SBA loans.

Possible But Improbable Success

1. Low interest loans.
2. Exemption of pollution control equipment from sales and property taxes.

Probably Successful

1. Subsidies and grants of large proportions of investment (e.g., 90% of costs).

2. Large direct offset charges against federal income taxes.

E - LOCATION OF DISLOCATIONS

PLANT CLOSURES AND UNEMPLOYMENT

The number of foundry closings from 1967 to 1980 has been projected earlier in this report as 652. For reasons cited earlier it is expected that foundry size will be the most important factor in the determination of continued viability in the face of large investment requirements for pollution control equipment. Expected closings to 1980 related to employment are as follows:

Employment	Number of Foundries in 1971	Present Dislocations	Number of Foundries Expected to Close
Over 250	202		-
100-249	324	8.3	27
50-99	341	40.1	137
20-49	409	57.3	234
1-19	359	70.8	254
Total	1,635		652

The number of foundries in each employment group expected to close through 1980 is based on an estimated stated earlier in this report, as shown on the following page.

Employment	Percent Closures
Over 250	0%
100-249	10
50-99	40
20-40	60
1-19	80

It is expected that the demand for a local casting supplier will mitigate against the closing of all foundries in any employment range within a market area or state. By retaining a minimum of one foundry in each of these geographical regions the actual closure percentages vary somewhat from the estimated norm.

Exhibit 36 shows present foundry distribution, distribution of foundries expected to close, distribution of dislocated employees, and re-employment potentials by state. Similar information is tabulated in Exhibit 37 by iron foundry market area, providing a more convenient and accurate base for determination of employment opportunities located in a smaller geographical area. The market area boundaries are indicated in Exhibit 38.

Total foundry closings, and the resulting unemployment figures vary slightly between the data in Exhibits 36 and 37. This condition is the result of the assumption that at least one foundry in each employment grouping and region will remain in business. It is believed that Exhibit 37 showing totals by the smaller market areas is a more realistic tabulation. The data

show 652 foundries expected to close by 1980 out of a current total of 1,635, or about 40%. Employee dislocations are expected to total approximately 26,480 of which about 13,212 will find employment in foundries located nearby. An estimated 2,250 dislocated employees with skills used in other industries will find employment outside of the foundry industry if economic conditions at the time of the foundry closing are such that job opportunities are reasonably good. The total net employee dislocation for this period is projected at 10,962 nationwide.

It is important to recognize that these data do not indicate a condition existing at any given moment but rather the totals for a ten-year period. Employee dislocations for any given year will be affected by a projected acceleration in foundry closings in the next two to three years. This will be caused by enforcement of recent pollution control legislation, and the passing of additional legislation in the near future.

A summary of data for the ten largest market area centers for the iron foundry industry, presented on the following page, shows that eight of the areas are located in the Great Lakes states, one in the South and one in the Far West.

Market Areas with Largest Concentrations of Iron Foundries

Market Area	Total Iron Foundries	Projected Dislocations		Re-Employment Opportunities		Net Employee Dislocations
		Foundries	Employees	in Foundry Industry	in Other Industries	
Pittsburgh	60	27	1,010	505	86	419
Cleveland	56	18	970	435	74	361
Los Angeles	51	23	945	473	80	393
Birmingham	50	15	600	300	51	249
Milwaukee	50	13	1,120	560	95	465
Chicago	49	16	835	418	71	347
St. Paul	41	20	1,235	618	105	513
Detroit	39	15	600	300	51	249
Dayton	35	8	580	290	49	241
Indianapolis	34	11	635	318	54	264

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It can be seen from the table that employee dislocations are independent of the sizes of the city and industrial work force. The economic impacts on St. Paul and Milwaukee, with over 1,100 employee dislocations, will be more severe than on Chicago with only 835. Similarly, the impact on Birmingham with 600 dislocated employees will be greater than on Detroit with the same number of dislocated employees but with a manufacturing work force 40% larger and a total work force almost six times as large.

The economic impact of foundry closings in marketing areas with few foundries will be small in terms of the national effect, but severe for employees. Re-employment opportunities within the industry for dislocated employees in the Boise market area, which includes southern Idaho and Western Oregon, will be almost non-existent if the single iron foundry in the city of Boise closes. Only two other iron foundries are located in the market area, and both are more than 200 miles from Boise. Similar situations occur in the majority of Western and Southern areas.

Seven states bordering on the Great Lakes are of particular interest because of the high degree of iron foundry concentration within their borders. These states, New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois and Wisconsin, contain 49.7% of the iron foundries, 44.0% of the foundries expected to close in the coming decade, and 48.6% of the dislocated employees resulting from these closures as shown in the table on the following page.

State	Total Iron Foundries	Projected Locations		Re-Employment Opportunities		Net Employee Dislocations
		Foundries	Employees	in Foundry Industry	in Other Industries	
New York	85	36	1,315	658	112	546
Pennsylvania	166	63	2,865	1,433	244	1,189
Ohio	164	59	2,745	1,373	233	1,140
Michigan	122	48	1,950	975	166	809
Indiana	79	27	1,190	595	101	494
Illinois	104	36	1,820	910	155	755
Wisconsin	93	33	1,090	545	93	452
Total	813	302	12,975	6,489	1,104	5,385
Percent of National Totals	49.7	44.0	48.6	-	-	48.6

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Projected foundry closings for these states are a smaller percentage than the figures for total foundries because of the greater concentration of medium and large jobbing and production foundries in this area. Few of these larger foundries are expected to close down in the coming decade. The large number of iron foundries in the major metropolitan Great Lakes states are expected to provide sufficient re-employment opportunities to limit the net employee dislocations to the quantities shown. The impact on castings purchasers will also be less severe due to the substantial number of remaining foundries within the seven-state area.

REASONS FOR CLOSING

Unpublished data made available by the Gray and Ductile Iron Founders and the American Foundrymen's Society list 162 foundries that have ceased operations in the past two years. Of this total 33 closed for reasons unrelated to pollution control legislation, or were other than iron foundries. The remaining 129 reported pollution control problems as a contributory factor influencing the decision to close down. No more definitive explanations were offered as to the specific aspect of the control problem.

In a smaller group of 34 iron foundries reported to have suspended operations in the past four months, three companies listed pollution control requirements as the only reason for closing. Three additional companies indicated this to be one of several factors responsible for the shut-down.

These data suggest that pollution control legislation is a major contributory factor in foundry closing. Close examination on a case-by-case basis, however, does not always bear out this inference. In some cases the other reasons quoted provide overwhelming justification for ceasing operations, and the pollution control investment factor merely reinforces the justification.

Typical non-pollution control reasons for shutting down, quoted from the survey, are as follows:

1. "Foundry destroyed by fire - too costly to rebuild."
2. "Equipment old and worn out - have decided to quit after 45 years and let someone else make the castings."
3. "Shortage of labor willing to do foundry work."
4. "Declining business, increasing costs."
5. "Company is bankrupt."
6. "Competition too tough for small company."

These reasons, alone and in various combinations, appear with slight variations throughout the survey.

Those foundries listing pollution control needs as the only reason for closing, refer to the equipment investment cost as the controlling factor rather than operating cost of the equipment, or the potential setback in competitive position resulting from increased costs being passed along to the customer.

The estimate of 663 foundry closings through 1980 has been projected on a statistical basis, and specific reasons for individual closings cannot be predicted with any certainty. There

is reason to expect, however, that the reasons for these projected closings will continue the historical trends of the recent past. A conservative estimate based on these closings is as follows:

1. Foundry closings due wholly or in large part to the substantial investment required for either pollution control equipment or low emission melting furnaces will approximate 10% of the total.

2. Foundry closings in which the investment required for pollution control equipment or low emission melting furnaces is a significant but not the only factor in the decision will approximate 50%.

3. Foundry closings in which non-pollution control reasons are the most significant factor will approximate 40%.

Since no foundries have been reported as closing down due to the costs of operating pollution control equipment, this factor is not reflected in the above. It is certain, however, that some foundries, having installed such equipment, will fail in the coming years due to high operating costs. It is expected that, even in these cases, the control equipment operating costs will not be the major factor resulting in the foundry shutting down.

F - COMPENSATORY FACTORS

NEW FOUNDRIES

Foundry locations, historically, have been selected on the basis of nearness to the casting market due to shipping costs.

As has been stated earlier, it is generally uneconomical to ship heavy, low value products over long distances.

Foundry working conditions, with few outstanding exceptions, are generally disagreeable and foundry labor is difficult to get and keep, although wages are usually fairly high. For these reasons successful foundries have become more mechanized and even automated in recent years. New foundries are therefore expensive to build and equip, and the cost is now being forced upward by the need for expensive pollution control equipment. The majority of recently built foundries usually operate two full shifts to reduce amortization costs on a per pound of good casting basis. Due to the large investment costs, small foundries are not being built at this time except for special and compelling reasons. Average skill level requirements are relatively low, particularly in the more mechanized foundry, and training periods are a matter of a few days or weeks for the majority of the workers. Thus, the size of the work force in an area being considered is a more important criterion than the availability of trained foundry personnel.

Raw material availability is not a problem in areas where a market for castings exist. The only raw materials purchased locally are scrap iron and steel, sand and limestone. Scrap metal is generally available everywhere except in very sparsely settled areas. Sand and limestone are almost universally available across the country. The remainder of the raw materials is normally shipped to foundries in all areas from their processing

points. These materials include pig iron, coke, ferroalloys, chemical and cereal binders and refractories.

Since there are no compelling reasons for building new foundries in areas where existing ones have closed, it is unlikely that this will occur unless, coincidentally, the location satisfies the criterion of building close to an established market.

RE-EMPLOYMENT OPPORTUNITIES WITHIN THE INDUSTRY

The loss of 40% of the existing foundries and their production capabilities, representing approximately 18% of the miscellaneous jobbing type castings, will require that the surviving foundries increase their labor forces to meet the increased demand. With a modest increase of this magnitude it is unlikely that any but direct labor personnel need be added to achieve the production increase. Greater utilization of existing employees and equipment is expected to increase productivity. For these reasons it is estimated that only 50% of the number of dislocated employees will be required by surviving foundries.

Additional employment opportunities exist for the dislocated employees in other than the foundry industries, as discussed elsewhere in this report. In addition, opportunities exist in non-ferrous and steel foundries, since the processes and techniques, as well as job classifications in these shops, are identical to, or closely allied with, the iron foundry process and techniques. Since identification and location of these foundries are beyond the scope of this study, no effort has been made to

quantify the number of job opportunities that might derive from this source. It is believed, however, that about 5% of the projected net dislocations might find employment in non-iron foundries.

G - NET EMPLOYMENT IMPACT

NET EMPLOYMENT IMPACT BY STATE AND MARKETING AREA

Foundry employee dislocations resulting from projected iron foundry closings through 1980 are tabulated by state in Exhibit 36 and by market area in Exhibit 37. The exhibits tabulate gross dislocations by foundry size and geographical area. Projected immediate re-employment opportunities on a statistical basis, by surviving foundries and by other non-foundry industries, are also shown. The net employee dislocation representing potential long-term unemployment is tabulated in the last column of each exhibit.

Since foundries are generally located near industrial markets, it would be expected that the largest dislocations, representing the foundry concentrations, would occur in the highly industrialized states. Exhibit 36 shows this to be true, with the largest number of net dislocations occurring in Ohio, Pennsylvania, Michigan, and Illinois. Substantial dislocations occur in the other Northeastern states, and in Alabama and California. Small dislocations conversely appear in the Northwest, Southwest,

Mountain, and South Central states where industry is less concentrated. Employment opportunities for dislocated employees will be greater in the industrialized areas, and particularly in the major cities. The impact on employment, however, can be severe, even in the Northeastern or Great Lakes states for smaller towns located away from the major cities. These towns, many of them agricultural or transportation centers, will not provide sufficient employment alternatives for dislocated foundry workers. Small population shifts may result as the workers move to the cities in an effort to find employment. Such shifts and, in fact, the whole impact problem are difficult to quantify because of the large number of foundries in the United States, and the special local or regional conditions that may exist.

Employee dislocations in the Great Lakes states have been discussed in the section on "Plant Closures and Unemployment." The table in that section shows that 48.6% of the total unemployment will occur in the seven states considered.

SKILL LEVELS OF DISLOCATED FOUNDRY LABOR

Foundry labor skills range from 145 to 277 as tabulated in Exhibit 26. The job evaluation plan used for the rating has a total range of 100 to 500 and is one of several plans widely accepted by industry. The skill ranking of a number of non-foundry benchmark job classifications, based on the same evaluations plan, is as shown on the following page.

Job Classification	Skill Ranking
Tool and Die Maker Journeyman	400
Sheet Metal Worker	335
Tool Room Machinist	315
Milling Machine Operator	251
Spray Painter	206
Production Machine Operator-Unskilled	155
Janitor-Sweeper	130

A comparison of the skill levels of foundry jobs shown in Exhibit 26 with the above factory jobs indicates the generally low skills required by foundries of their employees. The exhibit also shows that a skill level rating of 200 or less is all that is required of almost two-thirds of foundry workers.

Employee dislocations resulting from foundry closings will therefore consist largely of workers with low skill levels which are not directly transferrable to other industries due to the special nature of foundry work. Approximately 17% of production and non-production foundry employees possess skills in demand by other industries. Typical job classifications reflecting these skills are maintenance man, electrician, welder, lift truck operator, crane operator, guard, shipping, receiving and warehouse clerks in the shop; and general office classifications such as bookkeeper, accountant, clerk, stenographer, receptionist, telephone switchboard operator, and purchasing agent. Given a normal economic condition at the time of the plant closing, these workers

will have little trouble obtaining other employment. Re-employment opportunities at equivalent levels will be difficult for the remainder in areas where there are no ongoing foundries. Formal retraining programs or internal on-the-job training by a new employer will be required for this 83% of ex-foundry workers.

H - IMPACT ON LOCAL ECONOMY

ABILITY TO ABSORB UNEMPLOYMENT

The ability of an area to absorb unemployment resulting from the closing of a local foundry is related directly to the employment alternatives available to the dislocated foundry worker. In large cities, and more particularly, large industrial cities, the unemployed will be absorbed relatively quickly under normal economic conditions. If foundry skills are not in demand, many of the dislocated will require some sort of retraining, either on a formal basis, or by on-the-job training programs. Most of these workers, listed under the heading of Net Dislocations in Exhibits 36 and 37, will have to call on other skills from previous jobs, or start at the lowest pay and skill classification in other industries.

The greatest difficulty will occur in the small towns where the local foundry was the major employer or one of only a few industrial employers. In many cases in the Midwest, the nearest surviving foundry will be 30 to 50 miles distant, and in many Western and Southern areas the distance may be as great as 100 miles or more.

ADDITIONAL LOCAL UNEMPLOYMENT

The impact on local unemployment in the industries serving iron foundries is expected to be minor. Only scrap metal, sand and limestone are purchased locally by iron foundries. The closing of a foundry will result in forcing the local scrap dealer to find another purchaser for his product and possibly involve its transportation a moderate distance to a larger town or city. It is believed that the quantity of scrap metal presently recycled will remain unchanged.

The quantities of sand and limestone used by foundries are minor compared to the construction industry. It is expected that the loss of a foundry customer will not be a serious blow to a supplier of this material.

EXHIBIT 35

EFFECT OF POLLUTION CONTROL ON GRAY IRON CASTINGS PRICES, IN DOLLARS PER TON OF CASTINGS

Product	Melt Rate, Tons per Hour				
	4	8	16	30	50
Ingot Molds(1)			$ 2.21	$ 1.49	
Cast Iron Pressure Pipe(1)				1.49	$ 1.37
Cast Iron Soil Pipe(1)				1.49	1.37
Miscellaneous Castings					
Automotive(2)				1.91	1.76
Machinery(3)	$14.05	$ 6.03	3.32	2.23	
Miscellaneous Jobbing(3)	14.05	6.03	3.32	2.23	

Notes: (1) Castings yield of 90%.

(2) Castings yield of 70%.

(3) Castings yield of 60%.

Derived from data provided by Council for Environmental Quality.

No.	State	Distribution of Iron Foundries by Total Employment-1971								Distribution of Fr Closings-197		
		1-19	20-49	50-99	100-249	250-499	500-999	Over 1,000	Total	1-19	20-49	50-99
1.	Alabama	10	12	17	12	8	4	2	65	8	7	7
2.	Alaska	-	-	-	-	-	-	-	-	-	-	-
3.	Arizona	1	-	-	1	1	-	-	3	-	-	-
4.	Arkansas	5	-	1	3	-	-	-	9	4	-	-
5.	California	23	22	19	19	3	-	-	86	18	13	8
6.	Colorado	2	5	5	2	1	-	-	15	1	3	2
7.	Connecticut	6	3	10	7	2	-	-	28	5	2	4
8.	Delaware	1	-	-	-	-	-	-	1	-	-	-
9.	District of Columbia	-	-	-	-	-	-	-	-	-	-	-
10.	Florida	8	5	-	2	1	-	-	16	6	3	-
11.	Georgia	11	9	5	3	3	-	-	31	9	5	2
12.	Hawaii	-	1	-	-	-	-	-	1	-	-	-
13.	Idaho	3	-	-	-	-	-	-	3	2	-	-
14.	Illinois	10	23	30	23	11	2	5	104	8	14	12
15.	Indiana	14	13	15	24	8	2	3	79	11	8	6
16.	Iowa	3	12	10	8	4	-	1	38	2	7	4
17.	Kansas	8	7	7	2	-	-	-	24	6	4	3
18.	Kentucky	3	4	2	1	-	-	1	11	2	2	1
19.	Lousiana	6	4	-	1	-	-	-	11	5	2	-
20.	Maine	4	2	2	-	-	-	-	8	3	1	1
21.	Maryland	1	2	3	4	-	1	-	11	-	-	1
22.	Massachusetts	7	22	13	7	1	1	-	51	6	13	5
23.	Michigan	23	28	28	15	14	4	10	122	18	17	11
24.	Minnesota	11	10	9	5	-	-	-	35	9	6	4
25.	Mississippi	5	-	2	-	-	-	-	7	4	-	1
26.	Missouri	10	3	4	7	2	-	-	26	8	2	2
27.	Montana	1	1	-	-	-	-	-	2	-	-	-
28.	Nebraska	2	1	3	1	-	-	-	7	1	-	1
29.	Nevada	-	1	-	-	-	-	-	1	-	-	-
30.	New Hampshire	4	2	1	1	1	-	-	9	3	1	-
31.	New Jersey	11	8	11	4	8	2	-	44	9	5	4
32.	New Mexico	-	-	-	-	-	-	-	-	-	-	-
33.	New York	21	20	12	20	7	4	1	85	17	12	5
34.	North Carolina	9	12	6	1	-	1	0	29	7	7	2
35.	North Dakota	2	1	-	-	-	-	-	3	1	-	-
36.	Ohio	20	43	32	42	18	5	4	164	16	26	13
37.	Oklahoma	4	6	3	5	-	-	-	18	3	4	1
38.	Oregon	8	2	2	2	-	-	-	14	6	1	1
39.	Pennsylvania	25	40	38	43	14	6	-	166	20	24	15
40.	Rhode Island	2	2	3	2	-	1	-	10	1	1	1
41.	South Carolina	7	3	2	2	1	-	-	15	6	2	1
42.	South Dakota	-	1	-	-	-	-	-	1	-	-	-
43.	Tennessee	7	10	10	9	3	4	-	43	6	6	4
44.	Texas	21	16	7	10	2	2	1	59	17	10	3
45.	Utah	2	5	3	1	1	-	-	12	1	3	1
46.	Vermont	3	1	2	2	-	-	-	8	2	-	1
47.	Virginia	13	8	4	5	-	1	2	33	10	5	2
48.	Washington	11	5	1	3	1	-	-	21	9	3	-
49.	West Virginia	2	6	2	3	-	-	-	13	1	4	1
50.	Wisconsin	9	28	17	22	10	5	2	93	7	17	7
51.	Wyoming	-	-	-	-	-	-	-	-	-	-	-
	Total	359	409	341	324	125	45	32	1,635	278	240	137

IRON FOUNDRY EMPLOYEE DISLOCATIONS BY STATE, 1971-1980

n Foundries by ent-1971				Distribution of Projected Foundry Closings-1971-1980					Distribution of Projected Employee Dislocations-1971-1980					Dislocated Employees Absorbed by Remaining Foundries 1971-1980	Ot
0- 9	500- 999	Over 1,000	Total	1- 19	20- 49	50- 99	100- 249	Total	1- 19	20- 49	50- 99	100- 249	Total		
8	4	2	65	8	7	7	1	23	80	245	525	175	1,025	513	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1	-	-	3	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	9	4	-	-	-	4	40	-	-	-	40	20	
3	-	-	86	18	13	8	2	41	180	455	600	350	1,585	793	
1	-	-	15	1	3	2	-	6	10	105	150	-	265	133	
2	-	-	28	5	2	4	1	12	50	70	300	175	595	298	
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1	-	-	16	6	3	-	-	9	60	105	-	-	165	83	
3	-	-	31	9	5	2	-	16	90	175	150	-	415	208	
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	3	2	-	-	-	2	20	-	-	-	20	10	
11	2	5	104	8	14	12	2	36	80	490	900	350	1,820	910	
8	2	3	79	11	8	6	2	27	110	280	450	350	1,190	595	
4	-	1	38	2	7	4	1	14	20	245	300	175	740	370	
-	-	-	24	6	4	3	-	13	60	140	225	-	425	213	
-	-	1	11	2	2	1	-	5	20	70	75	-	165	83	
-	-	-	11	5	2	-	-	7	50	70	-	-	120	60	
-	-	-	8	3	1	1	-	5	30	35	75	-	140	70	
-	1	-	11	-	-	1	-	1	-	-	75	-	75	38	
1	1	-	51	6	13	5	1	25	60	455	375	175	1,065	533	
14	4	10	122	18	17	11	2	48	180	595	825	350	1,950	975	
-	-	-	35	9	6	4	1	20	90	210	300	175	775	388	
-	-	-	7	4	-	1	-	5	40	-	75	-	115	58	
2	-	-	26	8	2	2	1	13	80	70	150	175	475	238	
-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	7	1	-	1	-	2	10	-	75	-	85	43	
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	
1	-	-	9	3	1	-	-	4	30	35	-	-	65	33	
8	2	-	44	9	5	4	-	18	90	175	300	-	565	283	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7	4	1	85	17	12	5	2	36	170	420	375	350	1,315	658	
-	1	0	29	7	7	2	-	16	70	245	150	-	465	233	
-	-	-	3	1	-	-	-	1	10	-	-	-	10	5	
18	5	4	164	16	26	13	4	59	160	910	975	700	2,745	1,373	
-	-	-	18	3	4	1	1	9	30	140	75	175	420	210	
-	-	-	14	6	1	1	-	8	60	35	75	-	170	85	
24	6	-	166	20	24	15	4	63	200	840	1,125	700	2,865	1 433	
-	1	-	10	1	1	1	-	3	10	35	75	-	120	60	
1	-	-	15	6	2	1	-	9	60	70	75	-	205	103	
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	
3	4	-	43	6	6	4	1	17	60	210	300	175	745	373	
2	2	1	59	17	10	3	1	31	170	350	225	175	920	460	
1	-	-	12	1	3	1	-	5	10	105	75	-	190	95	
-	-	-	8	2	-	1	-	3	20	-	75	-	95	48	
-	1	2	33	10	5	2	1	18	100	175	150	175	600	300	
1	-	-	21	9	3	-	-	12	90	105	-	-	195	98	
-	-	-	13	1	4	1	-	6	10	140	-	-	150	75	
10	5	2	93	7	17	7	2	33	70	595	525	350	1,540	770	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
5	45	32	1,635	278	240	137	30	685	2,780	8,400	10,200	5,250	26,630	13,327	

EXHIBIT 36

EMPLOYEE DISLOCATIONS BY STATE, 1971-1980

of Projected Foundry -1971-1980			Distribution of Projected Employee Dislocations-1971-1980					Dislocated Employees Absorbed by Remaining Foundries 1971-1980	Dislocated Employees Absorbed by Other Industries 1971-1980	Net Employee Dislocations 1971-1980
50-99	100-249	Total	1-19	20-49	50-99	100-249	Total			
7	1	23	80	245	525	175	1,025	513	87	426
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	4	40	-	-	-	40	20	3	17
8	2	41	180	455	600	350	1,585	793	135	658
2	-	6	10	105	150	-	265	133	23	110
4	1	12	50	70	300	175	595	298	51	247
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	9	60	105	-	-	165	83	14	69
2	-	16	90	175	150	-	415	208	35	173
-	-	-	-	-	-	-	-	-	-	-
-	-	2	20	-	-	-	20	10	2	8
12	2	36	80	490	900	350	1,820	910	155	755
6	2	27	110	280	450	350	1,190	595	101	494
4	1	14	20	245	300	175	740	370	63	307
3	-	13	60	140	225	-	425	213	36	177
1	-	5	20	70	75	-	165	83	14	69
-	-	7	50	70	-	-	120	60	10	50
1	-	5	30	35	75	-	140	70	12	58
1	-	1	-	-	75	-	75	38	6	32
5	1	25	60	455	375	175	1,065	533	91	442
11	2	48	180	595	825	350	1,950	975	166	809
4	1	20	90	210	300	175	775	388	66	322
1	-	5	40	-	75	-	115	58	10	48
2	1	13	80	70	150	175	475	238	40	198
-	-	-	-	-	-	-	-	-	-	-
1	-	2	10	-	75	-	85	43	7	36
-	-	-	-	-	-	-	-	-	-	-
-	-	4	30	35	-	-	65	33	6	27
4	-	18	90	175	300	-	565	283	48	235
-	-	-	-	-	-	-	-	-	-	-
5	2	36	170	420	375	350	1,315	658	112	546
2	-	16	70	245	150	-	465	233	40	193
-	-	1	10	-	-	-	10	5	1	4
9	4	59	160	910	975	700	2,745	1,373	233	1,140
1	1	9	30	140	75	175	420	210	36	174
1	-	8	60	35	75	-	170	85	14	71
5	4	63	200	840	1,125	700	2,865	1,433	244	1,189
1	-	3	10	35	75	-	120	60	10	50
1	-	9	60	70	75	-	205	103	18	85
-	-	-	-	-	-	-	-	-	-	-
4	1	17	60	210	300	175	745	373	63	310
3	1	31	170	350	225	175	920	460	78	382
1	-	5	10	105	75	-	190	95	16	79
1	-	3	20	-	75	-	95	48	8	40
2	1	18	100	175	150	175	600	300	51	249
-	-	12	90	105	-	-	195	98	17	81
1	-	6	10	140	-	-	150	75	13	62
7	2	33	70	595	525	350	1,540	770	131	639
-	-	-	-	-	-	-	-	-	-	-
97	30	685	2,780	8,400	10,200	5,250	26,630	13,327	2,266	11,061

IRON FOUNDRY EMPLOYEE DI
BY MARKET AREA 197

Area No.	Marketing Area	Distribution of Iron Foundries by Total Employment								Distribution of Projected Foundry Closings				
		1-19	20-49	50-99	100-249	250-499	500-999	Over 1,000	Total	1-19	20-49	50-99	100-249	Total
1.	New York, New York	3	2	2	2	-	-	-	9	2	1	1	-	4
2.	Chicago, Illinois	2	16	10	11	9	-	1	49	1	10	4	1	16
3.	Newark, New Jersey	5	5	9	3	6	1	-	29	4	3	4	-	11
4.	Detroit, Michigan	9	9	12	2	1	1	5	39	5	5	5	-	15
5.	Pittsburgh, Pennsylvania	14	17	12	11	4	2	-	60	11	10	5	1	27
6.	Philadelphia, Pennsylvania	3	6	3	5	1	-	-	18	2	4	1	1	8
7.	Cleveland, Ohio	5	13	10	15	11	1	1	56	4	8	4	2	18
8.	Boston, Massachusetts	3	10	4	1	-	-	-	18	2	6	2	-	10
9.	San Francisco, California	13	5	6	6	2	-	-	32	10	3	2	1	16
10.	Los Angeles, California	10	15	12	13	1	-	-	51	8	9	5	1	23
11.	St. Louis, Missouri	8	4	9	7	3	-	-	31	6	2	4	1	13
12.	Providence, Rhode Island	5	8	6	2	-	1	-	22	4	5	2	-	11
13.	Greensboro, North Carolina	6	12	5	1	1	1	-	26	5	10	2	-	17
14.	Baltimore, Maryland	1	2	3	4	-	1	-	11	-	1	1	-	2
15.	Milwaukee, Wisconsin	-	11	11	18	6	3	1	50	-	7	4	2	13
16.	St. Paul, Minnesota	12	15	8	5	1	-	-	41	7	9	3	1	20
17.	Buffalo, New York	5	4	4	5	3	1	1	23	4	2	2	1	9
18.	New Haven, Connecticut	3	2	6	6	2	-	-	19	2	1	2	1	6
19.	Cincinnati, Ohio	2	6	5	8	2	-	-	23	1	4	2	1	8
20.	Indianapolis, Indiana	3	7	9	8	2	1	4	34	2	4	4	1	11
21.	Houston, Texas	11	4	1	2	2	1	-	21	9	2	-	-	11
22.	Youngstown, Ohio	6	2	6	6	4	-	-	24	5	1	2	1	9
23.	New Orleans, Louisiana	12	4	2	1	1	-	-	20	10	2	1	-	13
24.	Atlanta, Georgia	10	9	5	3	1	-	-	28	8	5	2	-	15
25.	Kansas City, Missouri	5	1	2	3	-	-	-	11	4	-	1	-	5
26.	Syracuse, New York	2	3	2	5	2	-	-	14	1	2	1	1	5
27.	Dallas, Texas	8	9	4	7	-	1	1	30	6	5	2	1	14
28.	Seattle, Washington	9	3	1	3	1	-	-	17	7	2	-	-	9
29.	Green Bay, Wisconsin	9	11	5	3	3	2	1	34	7	7	2	-	16
30.	Reading, Pennsylvania	-	5	9	10	2	2	-	28	-	3	4	1	8
31.	Dayton, Ohio	4	6	8	13	3	-	1	35	3	4	3	1	11
32.	Camden, New Jersey	6	3	2	1	2	1	-	15	5	2	1	-	8
33.	Albany, New York	6	3	2	1	-	1	-	13	5	2	1	-	8
34.	Portland, Oregon	8	3	2	2	-	-	-	15	6	2	1	-	9
35.	Toledo, Ohio	3	6	3	2	1	2	-	18	2	4	1	-	7
36.	Rochester, New York	-	5	-	6	-	-	-	11	-	3	-	1	4
37.	Worcester, Massachusetts	2	3	2	3	1	1	-	12	1	2	1	-	4
38.	Portland, Maine	4	2	2	-	-	-	-	8	3	1	1	-	5
39.	Richmond, Virginia	4	2	1	1	-	-	-	8	3	1	-	-	4
40.	Birmingham, Alabama	6	9	12	11	6	4	2	50	5	5	5	-	15
41.	Springfield, Massachusetts	2	3	4	3	-	-	-	12	1	2	2	-	5
42.	Bridgeport, Connecticut	1	1	4	1	-	-	-	7	-	-	2	-	2
43.	Columbus, Ohio	3	9	3	3	1	2	-	21	2	5	1	-	8
44.	York, Pennsylvania	1	9	6	9	1	2	-	28	-	5	2	1	8
45.	Manchester, New Hampshire	7	3	3	3	1	-	-	17	6	2	1	-	9
46.	Scranton, Pennsylvania	3	4	5	2	1	-	-	15	2	2	2	-	6

IRON FOUNDRY EMPLOYEE DISLOCATIONS
BY MARKET AREA 1971-1980

tribution of Projected Foundry Closings				Distribution of Projected Employee Dislocations 1971-1980					Dislocated Employees Absorbed by Remaining Foundries 1971-1980	Dislocated Employees Absorbed by Other Industries 1971-1980	Net Employees Dislocations 1971-1980
20-49	50-99	100-249	Total	1-19	20-49	50-99	100-249	Total			
1	1	-	4	20	35	75	-	130	65	11	54
10	4	1	16	10	350	300	175	835	418	71	342
3	4	-	11	40	105	300	-	445	223	38	185
5	5	-	15	50	175	375	-	600	300	51	249
10	5	1	27	110	350	375	175	1,010	505	86	419
4	1	1	8	20	140	75	175	410	205	35	170
8	4	2	18	40	280	300	350	970	435	74	361
6	2	-	10	20	210	150	-	380	190	32	158
3	2	1	16	100	105	150	175	530	265	45	220
9	5	1	23	80	315	375	175	945	473	80	393
2	4	1	13	60	70	300	175	605	303	52	251
5	2	-	11	40	175	150	-	365	153	31	152
10	2	-	17	50	350	150	-	550	275	47	228
1	1	-	2	-	35	75	-	110	55	9	46
7	4	2	13	-	245	525	350	1,120	560	95	465
9	3	1	20	70	315	675	175	1,235	618	105	513
2	2	1	9	40	70	150	175	435	218	37	181
1	2	1	6	20	35	75	175	305	153	26	127
4	2	1	8	10	140	300	175	625	313	53	260
4	4	1	11	20	140	300	175	635	318	54	264
2	-	-	11	90	70	-	-	160	80	14	66
1	2	1	9	50	35	150	175	410	205	35	170
2	1	-	13	100	70	75	-	245	123	21	102
5	2	-	15	80	175	150	-	405	203	35	168
-	1	-	5	40	-	75	-	115	58	10	48
2	1	1	5	10	70	75	175	330	165	28	137
5	2	1	14	60	175	150	175	560	280	48	232
2	-	-	9	70	70	-	-	140	70	12	58
7	2	-	16	70	245	150	-	465	233	40	193
3	4	1	8	-	105	300	175	580	290	49	241
4	3	1	11	30	140	225	175	570	285	48	237
2	1	-	8	50	70	75	-	195	98	17	81
2	1	-	8	50	70	75	-	195	98	17	81
2	1	-	9	60	70	75	-	205	103	18	85
4	1	-	7	20	140	75	-	235	118	20	98
3	-	1	4	-	105	-	175	280	140	24	116
2	1	-	4	10	70	75	-	155	78	13	65
1	1	-	5	30	35	75	-	140	70	12	58
1	-	-	4	30	35	-	-	65	33	6	27
5	5	-	15	50	175	375	-	600	300	51	249
2	2	-	5	10	70	150	-	230	115	20	95
-	2	-	2	-	-	150	-	150	75	13	62
5	1	-	8	20	175	75	-	270	135	23	112
5	2	1	8	-	175	150	175	500	250	42	208
2	1	-	9	60	70	75	-	205	103	18	85
2	2	-	6	20	70	150	-	240	120	20	100

IRON FOUNDRY EMPLOYEE DISLOCATIONS
BY MARKET AREA 1971-1980

Area No.	Marketing Area	Distribution of Iron Foundries by Total Employment								Distribution of Projected Foundry Closings					D
		1-19	20-49	50-99	100-249	250-499	500-999	Over 1,000	Total	1-19	20-49	50-99	100-249	Total	19
47.	Des Moines, Iowa	2	8	5	3	2	-	1	21	1	5	2	-	8	
48.	Omaha, Nebraska	1	2	4	1	1	-	-	9	-	1	2	-	3	
49.	Louisville, Kentucky	1	3	2	-	-	-	1	7	-	2	1	-	3	
50.	South Bend, Indiana	6	2	6	7	6	1	-	28	5	1	2	1	9	
51.	Grand Rapids, Michigan	3	9	6	4	7	-	1	30	2	5	2	-	9	
52.	Peoria, Illinois	2	2	4	3	-	1	2	14	1	1	2	-	4	
53.	Davenport, Iowa	3	6	7	9	1	-	1	27	2	4	3	1	10	
54.	Kalamazoo, Michigan	2	5	5	3	2	1	-	18	1	3	2	-	6	
55.	Rockford, Illinois	1	1	4	5	2	1	-	14	-	-	2	1	3	
56.	Charleston, West Virginia	-	4	1	3	-	-	1	9	-	2	-	-	2	
57.	Memphis, Tennessee	-	2	4	1	1	-	-	8	-	1	2	-	3	
58.	Roanoke, Virginia	6	3	1	2	-	1	2	15	5	2	-	-	7	
59.	Denver, Colorado	3	5	5	2	1	-	-	16	2	3	2	-	7	
60.	Binghampton, New York	2	1	2	1	1	2	-	9	1	-	1	-	2	
61.	Fort Wayne, Indiana	6	-	1	7	1	1	-	16	5	-	-	1	6	
62.	Erie, Pennsylvania	4	2	3	4	3	-	-	16	3	1	1	-	5	
63.	Evansville, Indiana	-	2	2	1	-	-	-	5	-	1	1	-	2	
64.	Nashville, Tennessee	-	4	-	3	-	-	-	7	-	2	-	-	2	
65.	Knoxville, Tennessee	7	3	2	1	-	-	-	13	6	2	1	-	9	
66.	Raleigh, North Carolina	2	1	3	1	-	-	-	7	1	-	1	-	2	
67.	Chattanooga, Tennessee	-	1	6	4	2	4	-	17	-	-	2	-	2	
68.	Columbia, South Carolina	5	2	-	1	-	-	-	8	4	1	-	-	5	
69.	Wichita, Kansas	7	6	5	1	-	-	-	19	6	4	2	-	12	
70.	Tulsa, Oklahoma	5	5	4	5	-	-	-	19	4	3	2	1	10	
71.	Harrisburg, Pennsylvania	1	-	2	-	1	-	-	4	-	-	1	-	1	
72.	Salt Lake City, Utah	2	6	3	1	1	-	-	13	1	4	1	-	6	
73.	Saginaw, Michigan	2	1	3	-	-	1	3	10	1	-	1	-	2	
74.	Norfolk, Virginia	5	1	2	1	-	-	-	9	4	-	1	-	5	
75.	Oklahoma City, Oklahoma	1	1	-	1	-	-	-	3	-	-	-	-	-	
76.	San Antonio, Texas	3	1	1	1	-	-	-	6	2	-	-	-	2	
77.	Poughkeepsie, New York	2	2	-	-	-	-	-	4	1	1	-	-	2	
78.	Wilmington, Delaware	1	-	-	-	-	-	-	1	-	-	-	-	-	
79.	Washington, D.C.	-	3	-	1	-	-	-	4	-	2	-	-	2	
80.	Montgomery, Alabama	2	3	3	1	1	-	-	10	1	2	1	-	4	
81.	Jacksonville, Florida	4	2	-	2	1	-	-	9	3	1	-	-	4	
82.	Little Rock, Arkansas	2	-	-	1	-	-	-	3	1	-	-	-	1	
83.	Butte, Montana	1	1	-	-	-	-	-	2	-	-	-	-	-	
84.	Savannah, Georgia	2	1	-	-	2	-	-	5	1	-	-	-	1	
85.	El Paso, Texas	1	1	1	-	-	-	-	3	-	-	-	-	-	
86.	Duluth, Minnesota	3	3	1	1	-	-	-	8	2	2	-	-	4	
87.	Spokane, Washington	2	1	-	-	-	-	-	3	1	-	-	-	1	
88.	Springfield, Missouri	1	2	2	-	-	-	-	5	-	1	1	-	2	
89.	Tampa, Florida	3	1	-	-	-	-	-	4	2	-	-	-	2	
90.	Lansing, Michigan	1	1	1	-	1	-	-	4	-	-	-	-	-	
91.	Flint, Michigan	3	1	-	3	-	-	1	8	2	-	-	-	2	
92.	Amarillo, Texas	-	1	-	-	-	-	-	1	-	-	-	-	-	
93.	San Diego, California	-	2	-	-	-	-	-	2	-	1	-	-	1	
94.	Boise, Idaho	3	-	-	-	-	-	-	3	2	-	-	-	2	
95.	Miami, Florida	1	2	-	-	-	-	-	3	-	1	-	-	1	
96.	Phoenix, Arizona	1	-	-	1	1	-	-	3	-	-	-	-	-	
	Total	359	409	341	324	125	45	32	1,635	254	234	137	27	652	2,54

FOUNDRY EMPLOYEE DISLOCATIONS
BY MARKET AREA 1971-1980

Distribution of Projected Foundry Closings				Distribution of Projected Employee Dislocations 1971-1980					Dislocated Employees Absorbed by Remaining Foundries 1971-1980	Dislocated Employees Absorbed by Other Industries 1971-1980	Net Employee Dislocation 1971-1980
1-19	20-49	50-99	100-249	Total	1-19	20-49	50-99	100-249	Total			
1	5	2	-	8	10	175	150	-	335	168	29	139
-	1	2	-	3	-	35	150	-	185	93	16	77
-	2	1	-	3	-	70	75	-	145	73	12	61
5	1	2	1	9	50	35	150	175	410	205	35	170
2	5	2	-	9	20	175	150	-	345	173	29	144
1	1	2	-	4	10	35	150	-	195	98	17	81
2	4	3	1	10	20	140	225	175	560	280	48	232
1	3	2	-	6	10	105	150	-	265	133	23	110
-	-	2	1	3	-	-	150	175	325	163	28	135
-	2	-	-	2	-	70	-	-	70	35	6	29
-	1	2	-	3	-	35	150	-	185	93	16	77
5	2	-	-	7	50	70	-	-	120	60	10	50
2	3	2	-	7	20	105	150	-	275	138	23	115
1	-	1	-	2	10	-	75	-	85	43	7	36
5	-	-	1	6	50	-	-	175	225	113	19	94
3	1	1	-	5	30	35	75	-	140	70	12	58
-	1	1	-	2	-	35	75	-	110	55	9	46
-	2	-	-	2	-	70	-	-	70	35	6	29
6	2	1	-	9	60	70	75	-	205	103	18	85
1	-	1	-	2	10	-	75	-	85	43	7	36
-	-	2	-	2	-	-	150	-	150	75	13	62
4	1	-	-	5	40	35	-	-	75	38	6	32
6	4	2	-	12	60	140	150	-	350	175	30	145
4	3	2	1	10	40	105	150	175	470	235	40	195
-	-	1	-	1	-	-	75	-	75	38	6	32
1	4	1	-	6	10	140	75	-	225	113	19	94
1	-	1	-	2	10	-	75	-	85	43	7	36
3	-	1	-	5	40	-	75	-	115	58	10	48
-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	2	20	-	-	-	20	10	2	8
1	1	-	-	2	10	35	-	-	45	23	4	19
-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	-	-	2	-	70	-	-	70	35	6	29
1	2	1	-	4	10	70	75	-	155	78	13	65
3	1	-	-	4	30	35	-	-	65	33	6	27
1	-	-	-	1	10	-	-	-	10	5	1	4
-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	1	10	-	-	-	10	5	1	4
-	-	-	-	-	-	-	-	-	-	-	-	-
4	2	-	-	4	20	70	-	-	90	45	8	37
1	-	-	-	1	10	-	-	-	10	5	1	4
2	1	1	-	2	-	35	75	-	110	55	9	46
2	-	-	-	2	20	-	-	-	20	10	2	8
-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	2	20	-	-	-	20	10	2	8
-	-	-	-	-	-	-	-	-	-	-	-	-
1	1	-	-	1	-	35	-	-	35	18	3	15
2	-	-	-	2	20	-	-	-	20	10	2	8
1	1	-	-	1	-	35	-	-	35	18	3	15
-	-	-	-	-	-	-	-	-	-	-	-	-
652	234	137	27	652	2,540	8,190	11,025	4,725	26,480	13,212	2,250	10,962

IRON FOUNDRY MARKET AREAS

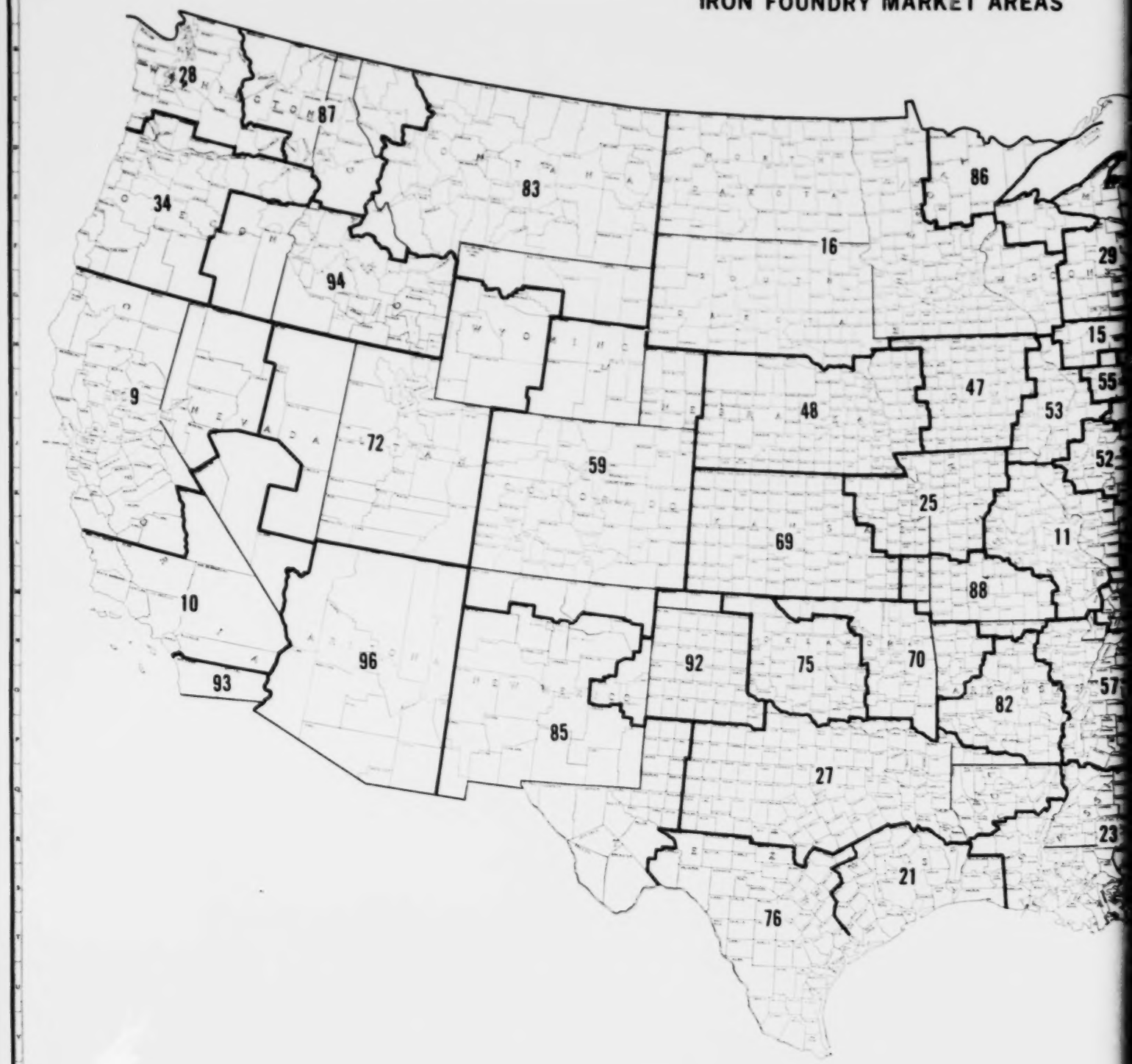

EXHIBIT 38

N FOUNDRY MARKET AREAS